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State of North Carolina  
Department of Environment, Health, and Natural Resources  
512 North Salisbury Street • Raleigh, North Carolina 27604-1148

James B. Hunt, Jr., Governor

Division of Solid Waste Management  
Telephone 919-733-2801

Jonathan B. Howes, Secretary

June 29, 1993

Mr. Craig Benedikt  
NC CERCLA Project Officer  
EPA Region IV Waste Division  
345 Courtland Street, NE  
Atlanta, Georgia 30365

DATE REPORT ACCEPTED

9/27/93

DISPOSITION

SEA (No Further Action)

SAM SIGNATURE

Craig Benedikt

Subject: Site Inspection  
Stroh/Chitney Farm  
Winston-Salem, Forsyth County, NC  
NCD 986 176 444

Dear Mr. Benedikt:

The enclosed report summarizes the results of a site inspection of the Stroh/Chitney Farm site completed by the North Carolina Superfund Section. Results of the SI indicate localized groundwater contamination at the site. The contaminants consist primarily of 2-butanone (methyl ethyl ketone, MEK), toluene, and 1,1,1-trichloroethene, each present at maximum concentrations exceeding 50 ppm. Other volatile aromatic and halogenated compounds are present at concentrations less than 10 ppm. Contaminants apparently originated from several 55 gallon drums reportedly buried at the site during the late 1970s.

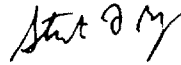
Results of the investigation to date do not indicate contamination of local drinking water supply wells or releases to surface water or air. Elevated concentration of acetone in upstream sediments indicates an additional offsite acetone source, probably located upstream of the site. Acetone detected in shallow soil samples at the site may have been deposited by irrigation water obtained from an upstream intake on the creek.

Although groundwater contamination has occurred at the site, sampling results indicate the impact to be limited in areal and vertical extent. Groundwater is used by an estimated 3601 people within 4 miles of the site.

Mr. Benedikt  
June 29, 1993  
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On the basis of the above findings, and HRS scoring, the North Carolina Superfund Section does not recommend the Stroh/Chitney Farm site for further action under CERCLA. If you have any questions, please contact me at (919) 733-2801.

Sincerely,

A handwritten signature in dark ink, appearing to read "Stuart F. Parker, Jr.", written in a cursive style.

Stuart F. Parker, Jr.  
Hydrogeologist,  
NC Superfund Section

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# **STATE OF NORTH CAROLINA**

*Department of Environment, Health,  
and Natural Resources  
Division of Solid Waste Management  
Superfund Section*

## ***SITE INSPECTION***

**Stroh/Chitney Farm  
Winston Salem, Forsyth County, North Carolina  
NCD 986 176 444**

**July 1993**

**Stuart Parker, Hydrogeologist  
Division of Solid Waste Management  
Superfund Section**

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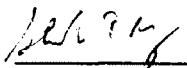
**SITE INSPECTION REPORT**

**Stroh/Chitney  
NCD 986 1765 444  
Forsyth County, Winston Salem, North Carolina**


**July 1993**

**Superfund Section  
Division of Solid Waste Management  
North Carolina Department of Environment, Health  
and Natural Resources**

**Prepared by:**

  
\_\_\_\_\_  
**Stuart Parker  
Hydrogeologist**

**Reviewed by:**

  
\_\_\_\_\_  
**Pat DeRosa  
CERCLA Branch Head**

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## EXECUTIVE SUMMARY

The Chitney Farm Site, a small, active farm operating south of Winston-Salem, North Carolina, has historically accepted chemical waste from a neighboring facility currently operated by the Stroh Container Company. Reportedly, 20 or more 55 gallon drums were buried onsite during the late 1970s, when the canning facility was owned by the Joseph Schlitz Company. Following an anonymous telephone report that 144 drums had been disposed at the site, Stroh Container Company retained Aquaterra, Inc., to conduct an environmental investigation at the site.

Aquaterra, Inc. completed a surface magnetic survey, and subsequent soil vapor, subsurface soil, and groundwater sampling programs at the site between 1989 and 1993, in an attempt to characterize site conditions and to identify the source of soil and groundwater contamination subsequently discovered at the site. Results of the study indicate localized contamination of subsurface soil and groundwater by volatile organic compounds (VOCs), including several volatile aromatic and halogenated compounds. Contaminants detected included many of the same compounds which were identified in Stroh Container Company's waste stream during RCRA inspections in the 1980s, and which were probably being used at the facility at the time of disposal.

Based on the cumulative results of soil and groundwater sampling by Aquaterra and the NC Superfund Section, detected contamination at the site is best characterized as a groundwater plume whose outer limits are defined by the locations of monitoring wells MW-5, MW-6, MW-7, MW-8, and MW-9. Low concentrations of acetone were detected in some of these wells, but other organic compounds detected in the plume and overlying soil were absent from these locations.

Soil and groundwater contaminants were detected primarily within the saprolite overburden, at minimum depth of 4 to 7 feet. Groundwater sampling results from the bedrock aquifer indicate the possible presence of 2-butanone (MEK), but do not indicate the presence of the other compounds detected in soil and groundwater at shallower depth.

Elevated concentrations of acetone were detected in onsite and background soil samples, and in stream sediments both upstream and downstream of the site. Despite the fact that the compound was detected in the groundwater plume, the acetone detected outside the plume cannot be attributed to the site. The origin of the acetone present in the soil and sediment has not been positively identified, but the possibility exists that it is discharged from an upstream source, drawn into the Chitney Farm irrigation intakes, and deposited to shallow soils onsite.

Approximately 3601 people within 4 miles of the site rely upon groundwater supplies for drinking water. The nearest private well is located north of the Chitney residence, approximately 400 feet upgradient of the suspected drum burial area. The well was sampled during the Site Inspection and no organic contamination was detected. The nearest offsite residence potentially using groundwater is located approximately 0.25 mile west of the site. One reported community supply well, which serves a mobile home park, exists within 2 miles of the site.



## EXECUTIVE SUMMARY

### PAGE 2

Results of investigations conducted by NC Superfund Section and by Aquaterra, Inc. do not indicate the release of contaminants from the site to local surface water bodies, surface soils or the atmosphere. The potential remains for future release to the 15-mile surface water pathway via groundwater seepage, however, chemical analysis of surface water and sediment samples, and of groundwater samples from downgradient of the area of contamination indicate that present contamination of the surface water pathway is limited to acetone from an offsite source.

Based on the lack of current contamination of drinking water wells, fisheries, or sensitive environments attributable to the site, no further remedial action under CERCLA is recommended at the site. It is recommended, however, that the State of North Carolina follow up the investigation of groundwater and surface water sediment contamination.

## **1.0 INTRODUCTION**

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the North Carolina Superfund Section conducted a Site Inspection (SI) at the Stroh/Chitney Farm site in Forsyth County, North Carolina. The purpose of this investigation was to collect information concerning conditions at the Stroh/Chitney Farm sufficient to assess the threat posed to human health and the environment and determine the need for additional investigation under CERCLA/SARA or other authority. The scope of the investigation included a file review, sampling of waste and environmental media to test Preliminary Assessment (PA) hypotheses and document HRS factor values and scores, collecting additional non-sampling information, and interviewing nearby residents.

## **2.0 SITE DESCRIPTION AND REGULATORY HISTORY**

### **2.1 Location**

The Stroh/Chitney Farm site, CERCLIS NCD 986 176 444, is located at the end of Overdale Road in a rural area south of Winston-Salem, in Forsyth County, North Carolina (Figure 1). The geographic coordinates of the site are 36° 01' 42.4" N latitude and 80° 14' 01" W longitude (Ref. 3). To access the site from the westbound I-40 Bypass south of Winston-Salem, exit to southbound US Route 52, travelling approximately 1 mile, exit to Clemmons Road, turning right, immediately turn left (south) onto South Main Street, and left again (east) onto Overdale Road. The property is at a bend in the road approximately 0.1 mile beyond an underpass at Route 52 (Ref. 52).

Forsyth County climate is characterized by hot, humid summers and mild winters, with average daytime temperatures of 77°F in July and 42°F in January. Net annual precipitation (total precipitation minus total evaporation) for the area is 4 inches per year (Ref. 25).

### **2.2 Site Description**

The site is located within a 127-acre farm, which has been owned and operated by Mr. Chitney since 1941 and is still active (Ref. 6,p. 3). The property includes barn structures and Mr. Chitney's home (Ref. 6,p. 1). The downslope portion of the property containing the site consists of agricultural fields with a small woodland to the southwest (Photograph 1). The site is bounded on the east by a Southern Railroad bridge and on the south by South Fork Muddy Creek. The remainder of the farm property lies north and west of the site location. Across the tracks and northeast of the site, the Corn Products, Inc., facility manufactures corn sweeteners and feed products (Ref. 47;Ref. 56). The Stroh Container Company operates to the northeast (Ref. 1). Another Stroh facility, the Stroh Brewery Company, 4791 Schlitz Avenue, operates across the creek to the south of the site (Ref. 57-58).

The property slopes to the south toward South Fork Muddy Creek (Ref. 1-2;Ref. 39). Irrigation sprayers which support the agricultural fields on the site are supplied by water pumped from the creek, and a drainage ditch located inside the property line discharges back to the stream. No visual evidence of stressed vegetation or discolored soil has been reported during site visits (Ref. 6;Ref. 39). Most, but not all, of the perimeter of the property is fenced (Ref. 6,p. 17).

### **2.3 Site Regulatory History**

The Stroh Container Company facility, located one mile northeast of the site on Old Milwaukee Lane, (Ref. 1;Ref. 6,p. 8;Ref. 52;Fig. 1). has operated since 1975, manufacturing two-piece printed aluminum beverage cans (Ref. 6,p. 13). A RCRA Generator Inspection was completed at the Stroh facility in December 1983, and a generator checklist completed in order to characterize the contents of the plant's manufacturing waste stream (Ref. 30;Ref. 29,p. 9).

During the period 1978-1979, a portion of the Chitney Farm was reportedly used for disposal of 55 gallon drums which originated at the Stroh Container Co., facility (Ref. 6,p. 5, 8-9). Disposal was to a trench measuring 15 feet long, 10 feet wide, and 6 to 8 feet deep (Ref. 6,p. 5, 7). On three subsequent occasions during 1986-1987, Mr. Chitney authorized onsite disposal of demolition debris (Ref. 6,p. 4).

In October of 1989 an anonymous caller reported to the Stroh Container Co. that an additional, much larger number of 55 gallon drums had been disposed at the site at an unspecified time (Ref. 6,p. 6;Ref. 42). In response, the Stroh Company hired Aquaterra, Inc. to complete a series of environmental investigations at the Chitney Farm. The investigations, which took place during the period November 1989 to April 1993 were undertaken in order to identify the disposal area and to characterize potential for release of hazardous materials to the environment. Mr. Chitney indicated the burial site's general location on the property, and Aquaterra undertook its initial explorations within a 2-acre area (Ref. 18;Ref. 42).

Aquaterra's investigations consisted of a magnetometer survey, followed by a soil vapor survey, and a soil boring and analytical sampling program. Subsequently, between June 1990 and February 1993, Aquaterra completed a multiphased monitoring well installation and groundwater sampling program in which a total of 9 overburden monitoring wells and one intermediate depth bedrock monitoring well were installed and sampled. An additional soil vapor survey was also performed at the site (Ref.18,Att. B-D).

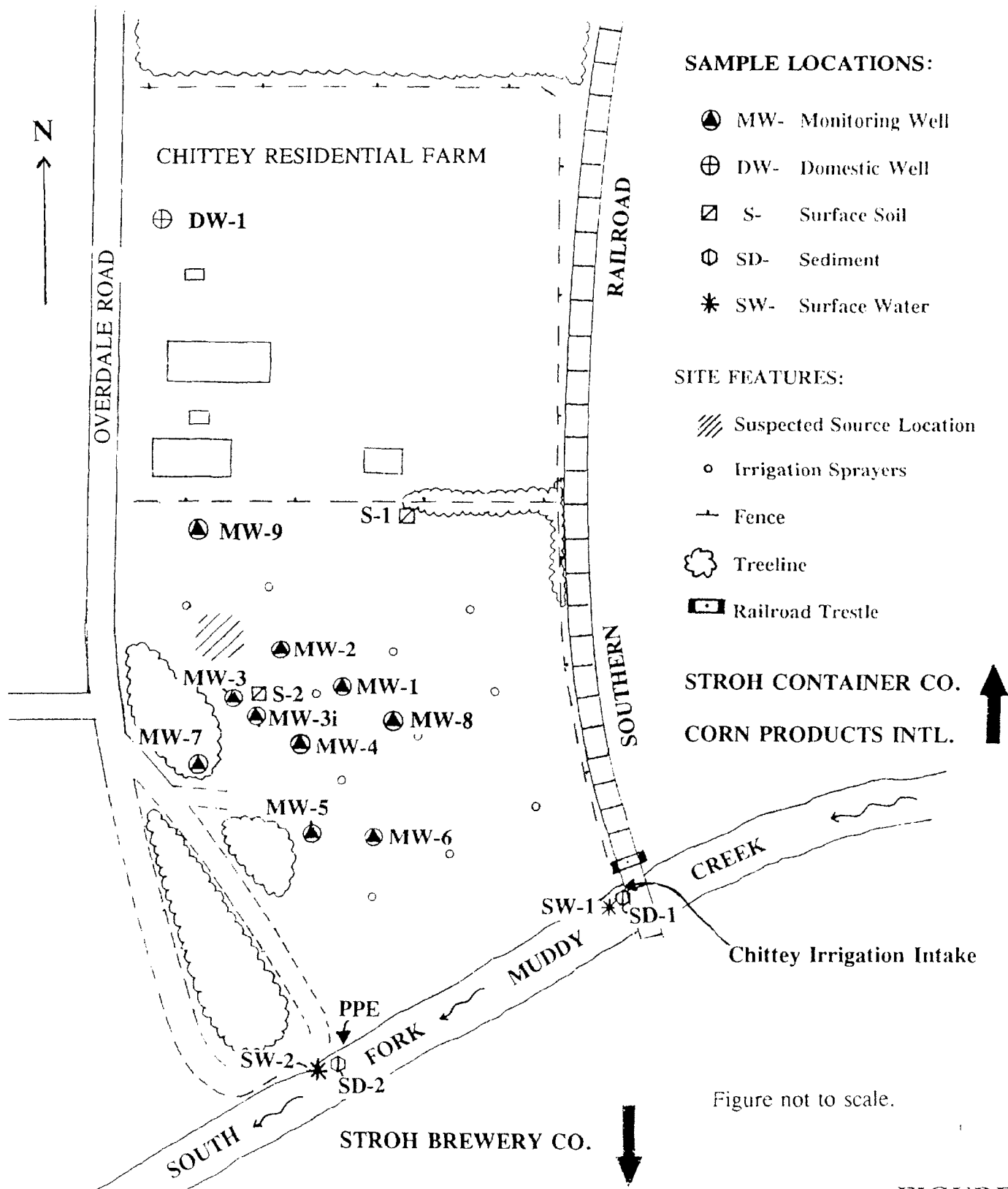
The NC Superfund Section completed a Preliminary Assessment of the site in March 1992. The subsequent Site Inspection, performed on April 22, 1992, included monitoring well sampling coordinated with Aquaterra, along with onsite and background soil sampling and collection of sediment and surface water samples from locations on South Fork Muddy Creek both upstream and downstream of the site. The NC Superfund Section also obtained a groundwater sample from the Chitney domestic well (Ref. 39;Table 1;Fig. 2).

**TABLE 1**  
**STROH/CHITTEY FARM**  
**SITE INSPECTION**  
**NCD 986 176 444**  
**Superfund Samples Collected Onsite**  
**April 22, 1992**

<b>Sample</b>	<b>Location</b>	<b>Type; Depth (ft.)</b>
MW-3 *	Onsite shallow monitoring well.	Water; 11-21
MW-3i *	Onsite intermediate monitoring well.	Water; 48.5-58.5
MW-4 *	Onsite shallow monitoring well.	Water; 8.5-18.5
MW-6 *	Onsite shallow monitoring well.	Water; 10-20
DW-1	North of site, Chitney domestic well.	Water; N.A.
SD-1	Upstream of site at trestle on South Fork Muddy Creek.	Sediment; < 1
SD-2	Downstream of site near shore on South Fork Muddy Creek.	Sediment; < 1
SW-1	Upstream of site at trestle on South Fork Muddy Creek.	Water; < 1
SW-2	Downstream of site near shore on South Fork Muddy Creek.	Water; < 1
S-1	Northeast of area of suspected contamination, adjacent to Fence.	Soil; < 1
S-2	Within area of suspected contamination, between monitoring wells MW-3 and MW-3i.	Soil; < 1

\* Split samples collected for Aquaterra, Inc., for independent analysis.

# SITE INSPECTION STROH/CHITTEY FARM NCD 986 176 444 SITE PLAN



**FIGURE 2**

### 3.0 OPERATIONAL HISTORY AND WASTE CHARACTERISTICS

Although the Chitney Farm has historically been used for agriculture, incidences of onsite disposal of materials from off site have been reported. The most recent disposal incident, which occurred during 1986-1987, involved pallets, concrete fill, sheet rock pieces, angle iron and plastic pieces (Ref. 6,p. 4).

Several 55 gallon drums, containing waste materials generated at the nearby Stroh Container Co. facility, were buried at the Chitney property. Estimates of the number of drums disposed at the site generally varied from 5 to 25 (Ref. 6,p. 5, 8, 9;Ref. 48), but the anonymous caller indicated that in another incident as many as 144 drums had been buried at the site (Ref. 6,p. 6;Ref. 42).

Mr. Chitney reported having permitted the burial of 20 drums onsite during the period 1979-1980, however, conflicting accounts have cast uncertainty on the identities of the persons who performed the burial. Mr. Chitney claimed to have witnessed the trench excavation but not the actual burial (Ref. 6,p. 5, 7), and could only approximate the location from memory, but was separately reported to have performed the burial himself (Ref. 42). A local landscaping contractor, who had completed past projects for Stroh Company, was also reported to have transported and buried the drums at the site (Ref. 6,p. 7), but similarly denied direct involvement, although he did admit having been present at the site at the time and having directed the transporters to the site. He also recalled that the drums were emitting a solvent-like odor at the time of their arrival (Ref. 48).

The Stroh Container Company facility, which operated as the Joseph Schlitz Container Company prior to takeover in 1982, has operated since 1975 (Ref. 6,p. 13;Ref. 56). The facility manufactures printed aluminum beverage cans, using processes which reportedly have changed little since the facility began production, with the exception of elimination in 1988 of a lid-manufacturing process which generated hexane waste (Ref. 39,p. 2). The remainder of the wastestream produced at the plant consists of mineral oil, water-based paint, container coatings, and spent solvents, including Safety-Kleen naphtha (Ref. 6,p. 14-16;Ref. 39,p. 2). Waste oil reportedly was stored in a concrete-lined pit. Other wastes were transferred from 5 gallon to 55 gallon containers prior to removal from the plant (Ref. 6,p. 15). The facility also uses three 12,000 gallon and two 17,500 gallon underground storage tanks for storage of laquers, varnishes, mineral oil, and a 35 % sulfuric acid cleaning solution (Ref. 45).

The wastes generated at the Stroh facility are regulated under RCRA as "F005" non-halogenated solvents. RCRA generator inspection forms indicated that the spent solvent wastestream consisted primarily of toluene and methyl ethyl ketone (MEK) with lesser concentrations of acetone, chlorobenzene, ethylbenzene, benzene, and methylene chloride (Ref. 29,p. 6-7;Ref. 35). The forms, however, did not include laboratory testing results for the wastestream.

The Stroh Brewery Company facility south of the site, which was the Joseph Schlitz Brewery Company prior to takeover in 1982 (Ref. 56), also underwent RCRA inspection in 1982, and was deleted from generator status in early 1983. The Stroh Brewery Company notified the State of the resumption of Regulated Waste Activity, involving generation of waste naphtha solvent, and the State reclassified the facility as a small quantity generator in 1992 (Ref. 58 - 65). The facility is also reported to use methanol as a solvent for a coding system, and to have used mineral spirits in the past (Ref. 57).

In 1976 and 1977 the Stroh Container Company reportedly employed "approved haulers" to remove waste materials from their facility (Ref. 39,p. 4). The waste disposal at the Chitney Farm took place in approximately 1979-1980 (Ref. 6,p. 8). Since 1981, RCRA-approved haulers have been used and the rate of waste production remained stable at approximately 70 55-gallon drums per calendar quarter (Ref. 6,p. 11). Heritage Environmental Services currently handles waste oil generated at the plant and transports it to Charlotte, NC. Heritage also transports the remaining waste materials to Indianapolis, Indiana (Ref. 6,p. 15). The Overdale Road Landfill, located approximately 0.5 mile north of the site (Ref. 1;Ref. 53;Fig. 1) operated for the City of Winston-Salem prior to 1977 and reopened in 1989 for demolition debris, but was not in operation during the intervening time period, according to representatives of Stroh Container Company (Ref. 6,p. 13).

Stroh employees interviewed by NC Superfund personnel in 1991 reported that the Stroh company notified the State of North Carolina about the anonymous telecommunication and allegations of disposal at the site, and initiated an internal investigation. Stroh contended that the smaller amount of waste material officially acknowledged to have been disposed at the Chitney site consisted of a quantity of mineral oil released during a spill incident at the container plant, and that the material was therefore nonhazardous. The Company characterized the disposal as an isolated incident dating prior to RCRA legislation of 1980 (Ref. 6,p. 6). The engineering manager believed to have authorized the disposal subsequently left the company, under circumstances that were not clear at the time of the Preliminary Assessment (Ref. 6,p. 10).

Aquaterra's environmental field investigation commenced in November 1989 with a magnetometer survey, results of which were inconclusive. Magnetic anomalies detected at the site were attributed by Aquaterra to near-surface metallic detritus and geologic sources (Ref. 42,p. 1), and no metallic drums were reportedly detected. An apparent correlation, however, exists between the location of the largest mapped magnetic anomaly and the subsequent mapped location of the highest organic vapor readings in soils (Ref. 18,p. 2, 5;Fig. 18-2).

In November 1989 Aquaterra conducted a near-surface soil vapor survey at the Chitney Farm using Petrex Tube methodology. The Petrex survey consisted of 60 collector tubes installed at depths of 18 inches or less below surface and allowed to accumulate trace soil vapors over a 23 day period. The survey covered an area approximately 120 by 160 feet, south and west of the suspected disposal area. Results of the Petrex tube survey indicated the presence in the subsurface soils of volatile organic compounds (VOCs), including dichloroethane, 1,1,1-trichloroethane, tetrachloroethene, benzene, ethylbenzene, toluene, xylenes, and naphthalene. Because the survey method converts cumulative ion counts into relative readings, direct quantification of the detected compounds was not possible (Ref. 18,p. 2, 5;Fig. 18-12 to 18-16).

Aquaterra completed 3 successive soil boring arrays in November 1989, and in February-March and October 1990 (Ref. 18,p. 2, 5-6;Fig. 18-7, 18-8, 18-11). The November 1989 program consisted of 19 borings distributed over a 100 foot long, 80 foot wide area extending to the southwest of the suspected disposal area (Ref. 18;Fig. 18-3). The borings, ranging in depth from 11 to 15 ft., were advanced in increments, and soils from 4, 7, and 11 ft. were screened for volatile organic compounds (VOCs) with an OVA flame ionization detector (Ref. 18,p. 2-3). Sample screening revealed the presence of VOCs at concentrations in excess of 10 ppm in 7 of the borings and in excess of 100 ppm in 2 borings (Ref. 18,Table 18-1). The area of elevated readings was approximately 60 feet wide, 80 feet long, and oval in shape (Ref. 18;Fig. 18-4 to 18-6).

The February 1990 soil boring program consisted of 9 borings completed in the same area as above (Ref. 18;Fig. 18-8). Aquaterra collected 10 laboratory analytical soil samples and 2 groundwater samples from the bottoms of the borings and had them analyzed for volatile organic compounds. One soil sample was also analyzed for semivolatile organic compounds. Analysis detected several VOCs, including dichloroethane, dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, methyl ethyl ketone, methylene chloride, toluene, and xylenes, in 6 of the soil samples. One or both of the groundwater samples contained VOCs, including dichloroethane, dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, and toluene (Ref. 18, p.6, Att. 18-E). VOCs were most concentrated in a single boring, where total detected concentration in soil was 38.6 ppm (Table 18-2). Bis (2-Ethylhexyl) phthalate was the only semivolatile compound detected (Ref. 18,p. E-21).

The third soil exploration program, initiated on October 30, 1990, consisted of 86, 11-15 foot deep borings intended to search for buried metal containers. Soil cuttings from the borings were monitored with a flame ionization detector and visually examined for metal drum fragments and evidence of oily waste consistent with Stroh Container Company's description of the material buried in 1978-79. Aquaterra submitted three samples of soil for analysis by SW-846 Method 9070 for oil and grease. One sample was found to contain 1200 mg/kg (ppm) of oil and grease, and the remaining samples were below the detection limit of 100 mg/kg (Ref. 18,p.3, Att. F). Metal fragments were detected in 8 of the borings, but the fragments did not appear to be from drums (Ref. 18,p. 6).



On June 13, 1990, Aquaterra initiated its first phase of monitoring well installation and groundwater sampling. Four shallow (20-25 ft. deep) monitoring wells, designated MW-1 through MW-4, respectively, were installed within the area of suspected contamination, downgradient of the suspected disposal area (Ref. 18,p. 3, Att. 18-A, 18-B;Fig. 18-9). Aquaterra sampled the monitoring wells on July 2-3, 1990. Samples were analyzed for VOCs, and samples MW-3 and MW-4 were analyzed for semivolatile organic compounds (SVOCs) (Ref. 18,p. 6, Att. 18-G, Table 18-3).

Subsequently, during the period January 28 to February 1, 1991, two additional shallow wells, designated MW-5 and MW-6, were completed at locations downgradient of the area of suspected contamination. Aquaterra also installed MW-3i, an intermediate-depth (58.5 foot) bedrock monitoring well adjacent to MW-3 (Ref. 18,p. 3-4, Att. 18- C;Fig. 18-9). The three new wells and MW-3 were sampled for VOCs on February 5, 1991 (Ref. 18,p. 6, Att. 18-H, Table 18-3).

On April 22, 1992 Aquaterra resampled groundwater at the seven monitoring wells at the site (Ref. 18,p. 6, Att. 18-I, Table 18-3). NC Superfund Section personnel Holly Spires, Pat DeRosa, and Thomas Power visited the site on the same date and collected split groundwater samples from the Aquaterra samplers at MW-3, MW-3i, MW-4, and MW-6 . NC Superfund Section personnel also collected one surface water and one sediment sample each from locations upstream and downstream from the site, one background soil sample from off site, one surface soil sample adjacent to shallow well MW-3, and a groundwater sample from the Chitney's water supply well (Ref. 39;Ref. 41).

Aquaterra performed additional work at the site subsequent to the NC Superfund Section Site Investigation. The consultant completed a second Petrex soil vapor survey from October 15 to November 10, 1992, covering an approximately 300 by 450 foot area which overlapped and included the area of previous soil vapor sampling. The purpose of the survey was to approximate the east-west extent of the groundwater contaminant plume, in order to optimize the locations of future monitoring well installation (Ref. 18,p. 4, Fig. 18-7, 18-11).

Using the data obtained from the second soil vapor survey, Aquaterra installed shallow monitoring wells MW-7, MW-8, and MW-9 at the site on February 10-11, 1993, in order to delineate the site's groundwater contaminant plume in cross-gradient (east-west) and upgradient (north) directions (Ref. 18,p. 4-5, Att. 18-D, Fig. 18-9). The wells ranged in depth from 14.5 to 26 feet. All 10 monitoring wells were sampled on February 15, 1993 (Ref. 18,p. 6, Att. 18-J, Table 18-3).

Results of Aquaterra's four groundwater sampling events indicate the presence of several groundwater contaminants at the site. The most highly concentrated compounds present are methyl ethyl ketone (MEK), toluene, and 1,1,1-trichloroethane, detected in MW-3 at 1700 ppm, 340 ppm, and 60 ppm, respectively, in February 1991. Additional compounds at the site, detected at concentrations ranging from 6 ppb to 19 ppm, included acetone, chloroethane, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, trichloroethene, tetrachloroethene, 1,2-dichloropropane, 4-methyl-2-pentanone (MIBK), benzene, ethylbenzene, xylenes, and methylene chloride (Ref. 18, p. 6, Att. 18-G, 18-H, 18-I, 18-J, Table 18-3). The highest total VOC concentration among the Aquaterra samples, 2100 ppm, was also detected in MW-3 on the above date (Ref. 18, Table 18-3).

Monitoring wells MW-5, MW-6, MW-7, MW-8, and MW-9 define the current limits of the groundwater contaminant plume in directions downgradient, crossgradient and upgradient of the site. Potential contaminants detected in these peripheral wells are limited to acetone, detected at 24 ppb upgradient of the site and 30 ppb downgradient of the plume (Ref. 18, Table 18-3), and 6 ppb of chloroform, a possible artifact.

## **4.0 GROUND WATER PATHWAY**

### **4.1 Hydrogeologic Setting**

Forsyth County is located near the western edge of the Piedmont Physiographic Province. The land surface within the province is generally underlain by saprolite, a layer of unconsolidated coarse sands, gravels, and clays ranging in thickness from a foot or two near bedrock outcrops to more than a 100 feet elsewhere. Saprolite is derived by the weathering of the various igneous, metamorphosed igneous, and sedimentary rocks in the region (Ref. 37, p. 26-27).

Three soil units are mapped within the site boundaries. Chewacla loam (Ch), a somewhat poorly drained seasonal floodplain soil, occurs in elongate zones adjacent to streams. Chewacla surface slopes range from 0 to 2 percent. Infiltration is moderate, and surface runoff is slow.

Louisburg-Wedowee complex soil (LwE) occurs further upslope and slopes 15 to 25 percent. LwE is well to excessively drained, with moderate to moderately slow infiltration and rapid runoff. Cecil Sandy Loam (CcB) occurs in the northwest corner of the site, sloping 2 to 6 percent; CcB is a well-drained upland soil with moderate infiltration and rapid runoff (Ref. 33).

Test borings completed at the site by Aquaterra generally penetrated either 8.5 to 16.5 feet of a reddish micaceous sandy silt or, in the downgradient wells, a brownish floodplain deposit consisting of 5 feet of silty sand underlain by another 5 feet of silt or sandy clay (Ref. 18, p. 9, Att. 18-B to 18-D; Ref. 33). In MW-8, however, saprolite was described in the uppermost strata. The deepest monitoring well, MW-3i, encountered saprolite at a depth of 14.9 feet, partially weathered rock at 37 feet, and fractured bedrock at 49 feet (Ref. 18, Att. 18-D).

Bedrock underlying the site is mapped as a coarse-grained granite formation of Pennsylvanian-Permian age. The formation locally intrudes the metamorphic biotite gneiss and schist which reportedly underlies approximately 85 per cent of Forsyth County. Bedrock surface is formed by the uplifted and partially dissected peneplain of the Piedmont Province (Ref. 36,p. 69). Observations made onsite by Aquaterra may additionally indicate an intrusion of diabase west of the site (Ref. 18,p. 9).

Water in the soils and saprolite is found in pore spaces, but water in relatively unweathered bedrock generally is limited to joints and fractures. The saprolite and underlying bedrock typically behave as a single unconfined aquifer. Recharge to the groundwater tends to be in the interstream areas as precipitation percolates downward to the water table (Ref. 37,p. 26-28). The groundwater discharges into the perennial streams and lakes, whose surface elevations approximate the water table (Ref. 37,p. 24).

Hydraulic conductivities for the soils typically encountered beneath the site are anticipated to range up to 10 -4 cm/sec (Ref. 22,p. 51601). Depth to groundwater was measured by Aquaterra from well casings which typically protrude 2 feet above land surface at the site (Ref. 18,Att. 18-B to 18-D), therefore, groundwater depths below land surface at the site range from 4 feet in wells closer to South Fork Muddy Creek to as much as 17 feet further upslope.

With the exceptions of MW-2, MW-7, and MW-9, the static water table measurements in the onsite monitoring wells indicate the top of the aquifer, based on water table elevation, to be located within the soil layers above the saprolite (Ref. 18,Table 18-4, 18-5, Att. 18-B to 18-D). Groundwater elevation data calculated by Aquaterra indicate groundwater flow to be in a south-southeast direction at 0.004 to 0.016 feet per day. Groundwater elevation measured at MW-3i is sufficiently similar to shallower MW-3 not to indicate the presence of a separate, confined bedrock aquifer (Ref. 18,p. 9, Table 18-4, 18-5).

#### **4.2 Groundwater Targets**

In Forsyth County, dug wells, usually 20 to 60 feet deep, yield adequate domestic supplies (Ref. 36,p. 69). Potable groundwater in the area is also obtained from drilled wells at depths ranging from 45 to 100 feet (Ref. 13). Deeper drilled wells in the regional gneiss unit provide moderate to moderately large supplies for municipal and industrial use at most places, while yields from wells drilled in granite are somewhat more limited. The average yield of wells in the granite is 7.8 gallons per minute and the water ranges from soft to extremely hard with increasing well depth (Ref. 36,p. 70).

According to Barry Shearing of the City of Winston Salem, 95 per cent of the citizens of Forsyth County who have potential access to city water are actually connected to the system (Ref. 11, 12). The remaining 5 per cent of that population, and others located outside of areas with access, use private groundwater wells (Ref. 12). The total population using groundwater within four miles of the site is approximately 3601 (Ref. 5;Ref. 24;Ref. 28; Table 2).

TABLE 2  
STROH/CHITTEY FARM  
SITE INSPECTION  
NCD 986 176 444  
POPULATION DATA

Radius (miles)	Population	Cumulative Population (Ref 24)	Population in areas w/o City water (Ref 1,2,24)	Population with City water access	Population on private wells	Community well population (Ref 5,49)	Total Groundwater Population
0-0.25	(1) 7 *	7	(2) 5	(1)-(2) = (3) 2	(2) + ((3)x0.05) = (4) 5	(5) 0	(4) + (5) 5
0.25-0.5	43 *	50	5	38	7	0	7
0.5-1.0	1483	1533	0	1483	74	0	74
1.0-2.0	7466	8999	12	7454	385	235	620
2.0-3.0	15,528	24,527	101	15,427	872	0	872
3.0-4.0	21,759	46,286	984	20,775	2023	0	2023

\* -- Population estimate based on review of field conditions, topographic maps, and aerial photographs.

No municipal wells are present within a 4-mile radius around the Chitney property. The single community well reportedly located in the 4-mile radius, 1.9 miles south of the site, services a trailer park (Ref. 1;Ref. 5;Ref. 49). A second trailer park, 0.8 miles southeast of the site, is located adjacent to Barnes Road, along the route for a 16-inch water main. The community also is not listed on the State's community well database, and therefore is assumed to be connected to the City of Winston-Salem water system (Ref. 5;Ref. 17).

The active Chitney drinking water well is located approximately 400 feet upgradient (north) from the disposal area, based on field descriptions and aerial photography (Ref. 6;Ref. 9). The well is 305 feet deep and supplies the Chitney residence and farm. Another well on the property, also reported to be upgradient (Ref. 6,p. 4) was used to supply 4 additional rental units operated by Chitney, but is not presently in use.

#### **4.3 Sample Locations**

Aquaterra installed 10 groundwater monitoring wells at the Stroh/Chitney Farm site during the course of its environmental investigation of the site. Wells MW-1 through MW-9 penetrate near surface soils and saprolite to depths of 14.5 to 26 feet, and MW-3i penetrates soils, saprolite, and granite bedrock to a depth of 58.5 feet (Ref. 18, Fig. 18-9, Att. 18-B to 18-D).

As previously discussed, Aquaterra, Inc. sampled groundwater onsite for the presence of volatile and semi-volatile organic compounds on 4 occasions. Wells MW-1 through MW-4 were sampled on July 2-3, 1990, wells MW-3, MW-3i, MW-5, and MW-6 were sampled in February 5, 1991, monitoring wells MW-1 through MW-6 and MW-3i were sampled in April 22, 1992, and again, along with MW-7 through MW-9, on February 15, 1993 (Ref. 18;Ref. 42).

NC Superfund Section collected split samples with Aquaterra from MW-3, MW-3i, MW-4, and MW-6 during the 1992 Site Inspection (Photograph 1). In addition, the Chitney domestic well was sampled (Photograph 7). The State samples were analyzed by the NC State Laboratory Public Health for purgeable (volatile organic) compounds, for acid base/ neutral extractible (semivolatile) organic compounds, and for 8 RCRA TCLP metals (Ref. 41; Appendix A; Fig. 2).

#### **4.4 Analytical Results**

Laboratory analytical results for groundwater samples collected by Aquaterra in July 1990 from wells MW-1 through MW-4 indicated the presence of 1,1-dichloroethene, 1,1-dichloroethane, 1,1,1-trichloroethane, tetrachloroethene, 2-butanone (methyl ethyl ketone, MEK), and toluene. Base/neutral/acid extractible organic compound analysis also detected benzoic acid in the MW-3 sample at 3.9 ppm. Trichloroethane, the most widely distributed chlorinated hydrocarbon at the site, was detected in samples MW-1 through MW-4 at concentrations ranging from 0.18 to 58 ppm. 1,1-Dichloroethene and tetrachloroethene were reported in sample MW-1 and both compounds plus 1,1-dichloroethane were detected in the MW-2 sample, all in concentrations less than 0.5 ppm (Ref. 18,Table 18-3, Att. 18-G).

Samples collected by Aquaterra from downgradient wells MW-5 and MW-6 on February 5, 1991 did not contain detectable concentrations of contaminants. Although the samples collected from MW-3 contained similar concentrations of contaminants to those detected previously, the sample obtained from nearby, deeper well MW-3i contained only trace concentrations of toluene and no other contaminants were detected in the sample (Ref. 18, Table 18-3, Att. 18-H).

Chemical analysis of the split samples collected by the NC Superfund Section during the April 1992 Site Inspection did not detect VOCs in water samples from MW-6, MW-3i, or the Chitney supply well. However, the test results confirmed the presence of VOCs in MW-3 and MW-4 (Table 3). Primary contaminants, present at concentrations greater than 50 ppm in MW-3, included 1,1,1-trichloroethane, toluene, and 2-butanone (MEK). Chlorinated compounds present in lower relative concentrations included tetrachloroethene, trichloroethene, dichloroethanes, dichloroethenes, chloroethane, methylene chloride, and 1,2-dichloropropane. Additional compounds detected included benzene, ethylbenzene, xylenes, 4-methyl-2-pentanone (methyl isobutyl ketone (MIBK)), and acetone. Except for trichloroethene, all volatile contaminants were detected in higher concentrations in the shallow well MW-3, in the area of suspected soil contamination, than in MW-4 further downgradient (Ref. 18, p. 35-36). Semivolatile organic compounds were not detected in the State groundwater samples, and barium, the only RCRA TCLP metal detected, was present in a concentration range of 0.09 - 0.28 ppm, below the element's drinking water MCL/MCLG of 2 ppm (Ref. 50). Analytical results are summarized in Tables 3 and 4.

Analytical data resulting from Aquaterra's concurrent sampling event were in general agreement with the NC Superfund Section sampling results, where applicable. The Aquaterra sampling results, however, indicated no trans-1,2-dichloroethene at MW-3 and MW-4, and a considerably lower trichloroethene concentration in MW-4 than the corresponding State sample, results for which were in the ppm range. Additionally, the Aquaterra sampling identified MEK, at a concentration of 190 ppb, at MW-3i, where none was detected by the State. Neither State nor Aquaterra field blanks contained detectable concentrations of MEK (Ref. 18, Att. 18-I; Ref. 42).

Results from Aquaterra's February 1993 groundwater sampling event indicated a marked decrease in concentrations of contaminants previously encountered in MW-1 and revealed no contaminants in MW-3i. Xylene concentrations had decreased in MW-3 and MW-4, however, total VOC concentrations in both samples were more than twice the totals detected in 1992. Concentrations of methyl ethyl ketone had increased 3- to 10-fold at the two monitoring wells, and 1,1-dichloroethene and 1,2-dichloroethene, which had been detected in the 1992 State sample were detected in MW-3 for the first time during Aquaterra sampling. Except for much higher MEK levels, lower trichloroethene, and the absence of MIBK, the MW-4 results were quantitatively very similar to the corresponding 1992 State sample (Ref. 18, Table 18-3, Att. 18-J; Ref. 41; Table 32; Appendix A).

TABLE 3  
STROH/CHITTEY FARM  
SITE INSPECTION  
NCD 986 176 444  
NC SUPERFUND WATER SAMPLE  
RESULTS: VOLATILE ORGANICS  
April 22, 1992

PARAMETER:	MW-3	MW-3J	MW-4	MW-6	DW-1	SW-1	SW-2	TRIP
Chloromethane	119	ND	9J	ND	ND	ND	ND	ND
Methylene chloride	223	ND	16	ND	ND	ND	ND	ND
Dichloroethylene, 1,1-	230	ND	82	ND	ND	ND	ND	ND
Dichloroethane, 1,1-	5702	ND	376	ND	ND	ND	ND	ND
Dichloroethylene, trans-1,2-	1437	ND	603	ND	ND	ND	ND	ND
Chloroform	TRACE	ND	ND	ND	ND	ND	ND	ND
Dichloroethane, 1,2-	77	ND	7	ND	ND	ND	ND	ND
Trichloroethane, 1,1,1-	60464	ND	2374	ND	ND	ND	ND	ND
Dichloropropane, 1,2-	219	ND	8	ND	ND	ND	ND	ND
Trichloroethylene	1956	ND	3238	ND	ND	ND	ND	ND
Benzene	405	ND	25	ND	ND	ND	ND	ND
Trichloroethane, 1,1,2-	38	ND	TRACE	ND	ND	ND	ND	ND
Tetrachloroethylene	6160	ND	13	ND	ND	ND	ND	ND
Toluene	90523	ND	5014	ND	ND	ND	ND	ND
Ethylbenzene	706	ND	37	ND	ND	ND	ND	ND
Acetone	2407	ND	801	ND	ND	ND	ND	ND
Butanone, 2- (M.E.K.)	115074	ND	8619	ND	ND	ND	ND	ND
Pentanone, 4-methyl-2-	357	ND	244	ND	ND	ND	ND	ND
Xylenes	2147	ND	119	ND	ND	ND	ND	ND
Tetrahydrofuran	ND	ND	ND	ND	ND	ND	ND	5J

NOTES: ND = Not detected above quantitation limit.  
J = Estimated Value.  
All results in ug/l.

TABLE 4  
STROH/CHITTEY FARM  
SITE INSPECTION  
NCD 986 176 444  
NC SUPERFUND WATER SAMPLE  
RESULTS: METALS  
April 22, 1992

PARAMETER:	DW-1	MW-3	MW-3i	MW-4	MW-6	SW-1	SW-2	MCL/MCLG
Arsenic	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	0.05
Barium	0.10	0.28	0.12	0.13	0.09	0.10	0.10	2
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Chromium	<0.010	<0.25	0.025	<0.010	<0.010	0.012	0.014	0.1
Lead	<0.005	0.034	<0.005	<0.005	<0.005	0.008	0.010	0.05*
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05
Silver	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**

\* Indicates use of Manganese MCL/MCLG, based on equivalent Toxicity, Non - karst Liquid Mobility, and River Persistence, due to changing Lead MCL/MCLG.

\*\* MCL/MCLG under review.

Mobility, and River Persistence, due to changing Silver MCL/MCLG.

NOTES: DW = Drinking Water Sample

MW = Monitoring Well Sample

SW = Surface Water Sample

MCL/MCLG from Superfund Chemical Data Matrix (SCDM) Appendix B (Ref. 50).

All results in mg/l.



Acetone was detected at 24 and 30 ppb concentrations in 1993 Aquaterra samples from both upgradient MW-9 and downgradient MW-6. No other volatile organic compounds were detected in these wells, or in MW-5, MW-7, or MW-8. Other parameters were not analyzed for the samples.

#### **4.5 Groundwater Pathway Conclusions**

The groundwater sampling results indicate a probable onsite source of volatile organic compounds. The absence of detected VOCs in MW-5 and MW-6, other than the traces of acetone mentioned above, indicate that contaminated groundwater had not migrated to their respective locations at the time of the sampling events. Although MEK was detected in one of four samples collected to date from MW-3i, the presence of the contaminant in the well is not supported by State split sampling results or by prior sampling at the well. Sampling results to date do not indicate vertical migration of contaminants to bedrock depth within the aquifer.

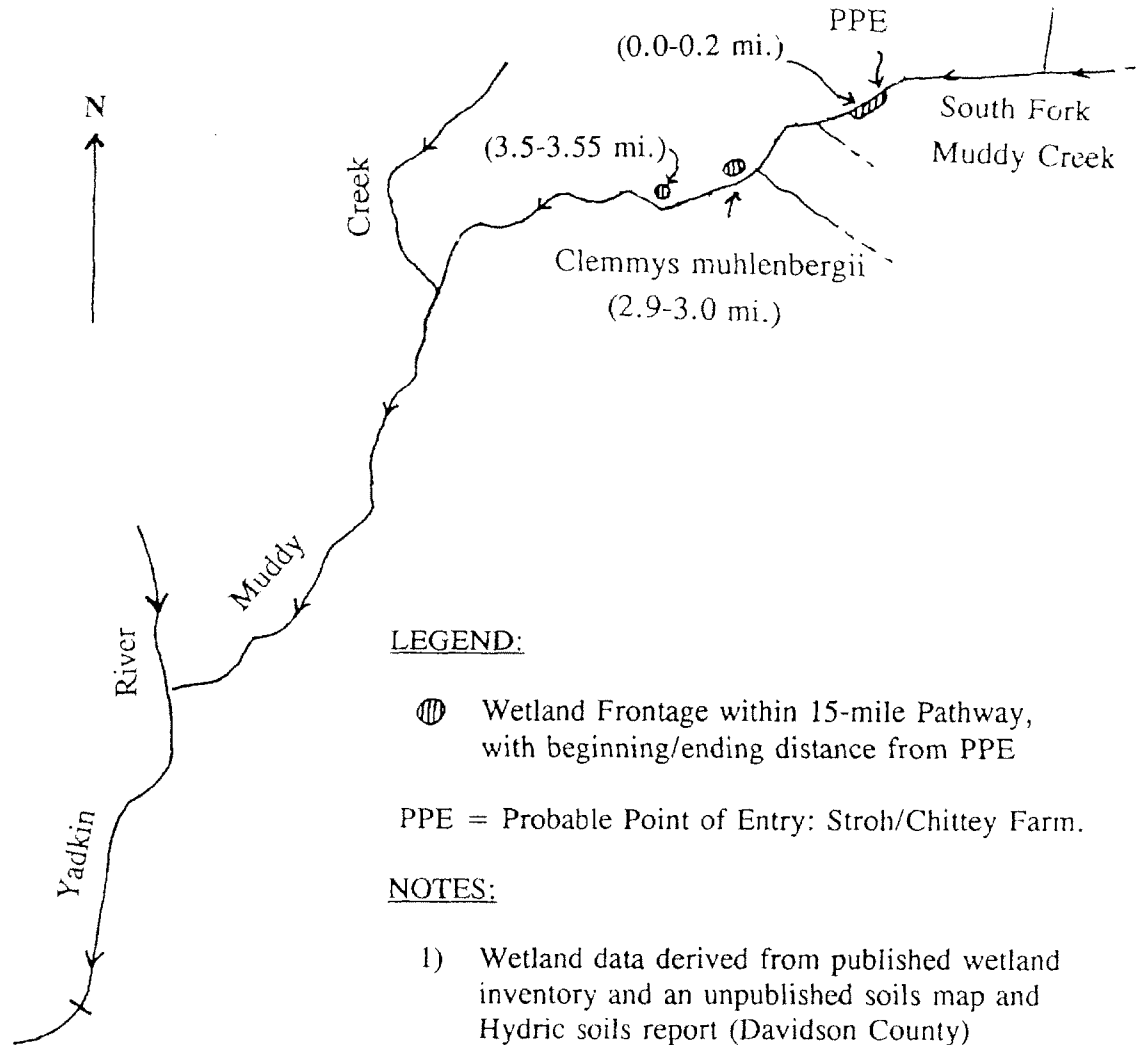
### **5.0 SURFACE WATER PATHWAY**

#### **5.1 Hydrologic Setting**

Runoff from the disposal area flows 600 feet south to the probable point of entry (PPE) of site drainage to South Fork Muddy Creek. This stream flows approximately 7 miles SSW toward Muddy Creek, which flows 4 miles to the Yadkin River. The fifteen mile surface water pathway ends approximately 4 miles south of where Muddy Creek enters the Yadkin River (Ref. 1, Figure 1; Figure 3). The average flows in segments of the pathway are: South Fork Muddy Creek, 21.6 cfs; Muddy Creek, 254.6 cfs; Yadkin River, 2350.5 cfs (Ref. 19;Ref. 31;Ref. 34). South Fork Muddy Creek is therefore classified as a small to moderate stream (Ref. 22,p. 51613). Although the southwestern portion of the property is part of a 100-500 year floodplain, the suspected burial location is outside the 500-year floodplain (Ref. 23).

South Fork Muddy Creek and Muddy Creek within Forsyth County have been designated Class C surface water, suitable for aquatic life propagation and survival, fishing, wildlife, and secondary recreation. Muddy Creek within Davidson County and the Yadkin River segment within the 15-mile surface water pathway are designated as Class WS-IV surface water, protected as water supplies in moderately-to-highly developed watersheds, with local programs required to control storm and nonpoint pollution discharge (Ref. 26, p. 13-15). The NC Division of Environmental Management (DEM) reported no NPDES permitting of discharges at any location on South Fork Muddy Creek (Ref. 44).

**SITE INSPECTION  
STROH/CHITTEY FARM  
NCD 986 176 444  
15-Mile Surface Water Pathway**



**FIGURE 3**

## **5.2 Surface Water Targets**

Surface drinking water intakes are not present within the 15-mile surface water pathway downstream of the site (Ref. 8;Ref. 12;Ref. 54). The Winston-Salem municipal intake is located on the Yadkin River (Idles Dam) 5 miles upstream of Muddy Creek. Residents not served by the city obtain drinking water from private or community wells (Ref. 5;Ref. 12;Ref. 36).

The nearest wetland downstream from the site consists of an approximately 0.2 mile frontage that begins directly opposite the site on South Fork Muddy Creek, at the PPE (Ref. 32;Ref. 33). An additional 0.15 mile of wetland frontage are mapped on the floodplain within the published map range of 6.7 miles downstream from the PPE. Unpublished soils mapping worksheets (Ref. 20) do not presently indicate the continuation of such soil types further downstream within the 15-mile surface water pathway.

Muddy Creek is reported to be a minor fishery, while the Yadkin River supports a more significant yield (Ref. 43). *Clemmys muhlenbergii* (bog turtle) is documented by the North Carolina Natural Heritage Program along the fifteen mile surface water pathway, at a small area of wetland approximately 3 miles downstream from the site on South Fork Muddy Creek. The species is classified by North Carolina as Threatened and listed as rare or uncommon. Federally, the species is considered potentially vulnerable, requiring further study. Globally, it is considered Secure, but quite rare in its range (Ref. 2;Ref. 4).

## **5.3 Sample Locations**

On April 22, 1992 two surface water and two stream sediment samples were collected on South Fork Muddy Creek by NC Superfund Section personnel. Sample locations are shown in Figure 2. One sediment (SD-1) and surface water (SW-1) sample were collected upstream from the site under the railroad trestle along the bank of the South Fork Muddy Creek (Ref. 39,p. 11), in the vicinity of the irrigation water intake (Photographs 4-5). One sediment (SD-2) and surface water (SW-2) sample were taken downstream from the site (Photograph 6) where a drainage ditch from the site enters South Fork Muddy Creek (Ref. 39,p. 14). Samples were analyzed for volatile and semivolatile organic compounds, as well as 8 RCRA TCLP metals.

## **5.4 Analytical Results**

Acetone, the only organic contaminant detected in the sediment samples, was present in both the upstream and downstream samples, but was not detected in the two surface water samples or in the sample trip blank (Table 3). The upstream sample SD-1 contained 672 ppb of acetone, a higher concentration than the downstream sample SD-2, which contained 394 ppb. Barium and lead were detected in the upstream sediment samples at concentrations within established ambient ranges for each element (Ref. 40). The downstream sample contained a lower concentration of barium, and no detectible lead (Table 5).

TABLE 5  
STROH/CHITTEY FARM  
SITE INSPECTION  
NCD 986 176 444  
NC SUPERFUND SEDIMENT AND SOIL  
SAMPLE RESULTS: METALS  
April 22, 1992

PARAMETER:	SD-1	SD-2	S-1	S-2
INORGANIC CHEMISTRY (mg/kg):				
Arsenic	<1.9	<1.9	<1.9	<1.9
Barium	74	27	160	88
Cadmium	<16	<16	<16	<16
Chromium	<20	<20	29	33
Lead	29	<20	27	25
Mercury	<0.09	<0.09	<0.09	<0.09
Selenium	<1	<1	<1	<1
Silver	<20	<20	<20	<20
TCLP (mg/l):				
Arsenic	<0.01	<0.01	<0.01	<0.01
Barium	0.71	0.36	0.42	0.62
Cadmium	<0.08	<0.08	<0.08	<0.08
Chromium	<0.10	<0.10	<0.10	<0.10
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.02	<0.02	<0.02	<0.02
Selenium	<0.005	<0.005	<0.005	<0.005
Silver	<0.10	<0.10	<0.10	<0.10

NOTES: SD = Sediment Sample  
S = Soil Sample

No organic contaminants were detected in the 2 surface water samples. Barium was detected in both the upstream and the downstream samples at 0.10 mg/l. Chromium was detected at 0.012 mg/l upstream and 0.014 mg/l downstream. Lead was detected at 0.008 mg/l upstream and 0.010 mg/l downstream. All 3 detected elements were present in the surface water samples at concentrations below applicable benchmark values (Ref. 50;Table 5).

Corn Products, Inc., located northeast of the site, reportedly does not use acetone. The plant's 2500 ppm carbohydrate waste stream is disposed via sanitary sewer, and the facility discards its refuse at the local municipal dump. Storm runoff at the facility is controlled by a retention pond which discharges to South Fork Muddy Creek (Ref. 1;Ref. 44;Ref. 47). Acetone was reportedly used at the Stroh Container Company facility and was identified as a minor component of their F005 waste (Ref. 29,p. 6;Ref. 46).

## **5.5 Surface Water Pathway Conclusions**

Results of chemical testing indicate contamination of stream sediments in South Fork Muddy Creek by acetone, which has also been detected in groundwater onsite. Acetone was not detected in surface water samples. Due to the relatively higher concentrations of acetone in the upstream versus the downstream sediments, and the apparent absence in sediment of other site contaminants, the acetone present in the sediments is believed to have originated from an unidentified offsite source. Barium, chromium and lead were detected in upstream and downstream surface water samples. Barium was detected in both corresponding sediment samples and lead was detected in the upstream sediment sample. All identified elements, however, were present at concentrations below applicable benchmark values. On the basis of the above observations and findings, contaminant release to surface water from the Chitney Farm is not suspected.

## **6.0 SOIL EXPOSURE AND AIR PATHWAYS**

### **6.1 Physical Conditions**

The site is currently a farm and is cultivated by plowing to grow corn and other crops. Additionally, refuse piles are present in the vicinity of the barn and the house. Public access to the site is not completely restricted by fencing (Ref. 6,p. 16). Surface and subsurface soils at the site consist of mixed sandy silt, silty sand, and clay, and an underlying granitic saprolite.

Aquaterra conducted 2 soil vapor surveys at the Chitney Farm, using Petrex Tube methodology, in November 1989 and in October-November 1992. The first survey indicated the presence in subsurface soils at the site of dichloroethane, 1,1,1-trichloroethane, tetrachloroethene, benzene, ethylbenzene, toluene, xylenes, and naphthalene. The second Petrex soil vapor survey covered a larger area than the first survey, and was used to help delineate the contaminant plume. Results of the second survey indicated the presence of scattered toluene plumes (Ref. 18,p. 5, Fig. 18-7, 18-11, 18-12 to 18-16). Petrex surveys respond to migration of vapor traces from underground sources to shallower soils, but cannot quantify contaminant concentrations.

Aquaterra completed 3 successive soil boring arrays in November 1989, and in February-March and October 1990. The first program screened soil cuttings with a flame ionization detector (FID) at various locations and depths (Ref. 18, Fig. 18-2 to 18-6) in order to delineate elevated VOC locations. The second program collected 10 laboratory analytical soil samples and 2 groundwater samples at depth within the borings and submitted them to be analyzed for volatile organic compounds. One soil sample was also analyzed for semivolatile organic compounds. The third soil exploration program searched for evidence of buried metal drums and collected 3 soil samples for oil and grease analysis (Ref. 18, p. 2, 3, 5-6; Fig. 18-3, 18-8).

Results of the soil boring programs indicated subsurface contamination by VOCs, including 1,1-dichloroethane, 1,1 dichloroethene, 1,2 dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, methyl ethyl ketone, methylene chloride, toluene, and xylenes (Ref. 18, p. 6, Att. 18-E). VOCs were most concentrated in a single boring, where total detected concentration in soil was 38.6 ppm (Ref. 18, Table 18-2). Bis (2-Ethylhexyl) phthalate was the only semivolatile compound detected (Ref. 18, p. E-21). Metal fragments and some oil and grease were encountered during the third program, but were not attributable to buried drums.

Elevated total VOC concentrations were detected in one boring at 4 feet depth, but generally became apparent at the 7 foot level (Ref. 18, Fig. 18-1). Because Aquaterra's shallowest FID screening occurred at 4 feet, however, and because of the quantitative limitations of the shallower Petrex tube method, quantitative data on soil contamination in shallow soils is limited to the analytical results of State sample S-2.

## **6.2 Soil and Air Targets**

Three people live and/or work on the site (Ref. 6, p. 4). The nearest residence to the site is located approximately 0.25 mile to the west (Ref. 1; Ref. 9). No daycare centers or schools are present within 200 ft. of the site (Ref. 1).

The Stroh Container Company, located at 4000 Old Milwaukee Lane, has 245 employees (Ref. 6, p. 14). The facility is approximately 1 to 2 miles north of the Chitney Farm. Corn Products International, located 200 feet northeast of the site, has 100 employees (Ref. 9). The total population within four miles of the site, as determined by visual observation, topographic maps and census information, equals 46,286 (Ref. 1; Ref. 9; Ref. 21; Ref. 24; Ref. 28; Table 1).

Merope Tuber, an insect (earwigfly) is documented by the North Carolina Natural Heritage Program approximately 0.7 miles west of the site (Ref. 1; Ref. 2; Fig. 1). The species is classified by North Carolina as being of Special Concern, requiring monitoring, and globally is considered to be critically imperiled due to extreme rarity (Ref. 4). *Clemmys Muhlenbergii* (bog turtle) is also documented at a second location in the study area by the North Carolina Natural Heritage Program (Ref. 4). The second location is along Leak Creek approximately 2.1 miles southwest of the site (Ref. 1; Ref. 2). The species is classified by North Carolina as Threatened and listed as rare or uncommon.

Federally, the species is considered potentially vulnerable, requiring further study. Globally, it is considered Secure, but quite rare in its range (Ref. 4).

### **6.3 Soil Sample Locations**

Based on the areal and vertical distribution of elevated OVA readings reported from Aquaterra's soil investigation, NC Superfund Section selected two locations at the site for the collection of surface (0-2 foot deep) soil samples to evaluate potential hazards from soil exposure. Soil sample S-1, the designated background sample, was collected from 1.5 - 2.0 feet deep at a location approximately five feet south of the fence surrounding the barn area and 100 feet west of a fence which parallels the railroad tracks on the east side of the site (Ref. 39,p. 15; Photograph 2). The other soil sample, S-2, was collected from 1 - 2 feet deep (Ref. 39,p. 12) at a location intermediate between MW-3 and MW-3i (Photograph 3) in order to determine whether contaminants detected at depth were also present near the surface. Soil sample locations are shown in Figure 2. Samples were analyzed at the State Laboratory of Public Health for volatile and semivolatile organic compounds, and for 8 RCRA TCLP metals.

### **6.4 Soil Analytical Results**

Acetone was detected in onsite sample S-2 at a concentration of 157 ppb, but was also detected in background soil sample S-1 at 259 ppb (Ref. 41;Appendix A), which indicates a probable offsite source for the compound. No other VOCs or semivolatile compounds were detected in the sample. Barium, chromium and lead were detected in both soil samples at concentrations within established ambient ranges for each element, and with no significant difference in concentration between samples (Ref. 40). Analytical results for inorganic elements are presented in Table 5.

### **6.5 Air Analytical Results**

Formal ambient air monitoring was not conducted by NC Superfund Section during site visits. A portable organic vapor analyzer (OVA) was carried on site during the Site Inspection, however, no measurements above background were observed (Ref. 39,p. 12, 15).

### **6.6 Soil and Air Pathway Conclusions**

Although traces of VOCs could be cumulatively detected at 18 inches below ground surface by the Petrex tube soil vapor survey, site contaminants were not detected by analysis of a soil sample collected at the same depth from the area of known groundwater contamination, indicating that surface soils at the site have not been contaminated by the waste materials released to the subsurface at the site. Although the onsite soil sample S-2 contained acetone, the detected concentration was two orders of magnitude less than the applicable Superfund Chemical Data Matrix (SCDM) Reference Dosage for soils (Ref. 50). Offsite sampling results generally support the attribution of elevated background acetone concentrations to an unidentified offsite source.

Because contamination was not detected in subsurface soils from less than 4 feet deep, because elevated concentrations of VOCs were not detected in ambient air during the Superfund Site Inspection, release of onsite contaminants to surface soil or air pathways under present site conditions is considered unlikely.

## **7.0 SUMMARY AND CONCLUSIONS**

The Chitney Farm Site has historically accepted chemical waste from Stroh Container Company, allowing onsite burial of approximately 20, 55 gallon drums on at least one occasion. An anonymous source has alleged additional, undocumented disposal of an additional 144 drums, resulting in an environmental investigation of the site by a contractor, Aquaterra, Inc., under for Stroh Container Company.

Aquaterra, Inc. completed a surface magnetic survey, and subsequent soil vapor, subsurface soil, and groundwater sampling programs at the site between 1989 and 1993, in an attempt to characterize site conditions and to identify the source of soil and groundwater contamination subsequently discovered at the site. Results of the study indicate localized contamination of subsurface soil and groundwater by volatile organic compounds (VOCs), including 1,1,1 trichloroethane, toluene, and 2-butanone (MEK), tetrachloroethene, trichloroethene, 1,2-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, chloroethane, methylene chloride, and 1,2 dichloropropane, benzene, ethylbenzene, xylenes, 4-methyl-2-pentanone (methyl isobutyl ketone (MIBK)), and acetone. Contaminants detected included many of the same compounds identified in Stroh Container Company's waste stream during RCRA inspections.

Subsurface contamination by VOCs other than low ppb concentrations of acetone is presently restricted to an onsite location upgradient of monitoring wells MW-5 and MW-6 and downgradient of the Chitney Farm domestic well, all three of which were sampled during the April 22, 1992 NC Superfund Section Site Inspection and found not to have been contaminated. Contaminants are present primarily within the saprolite overburden, at minimum depth of 4 to 7 feet. Groundwater sampling results from the bedrock aquifer indicate the possible presence of 2-butanone (MEK), but do not indicate the presence of the other compounds associated with the drum burials and with detected soil and groundwater contamination at shallower depth. Elevated background concentrations of acetone in soil and surface water sediments cannot be attributed to the site, and the origin of the acetone has not been positively identified.

Approximately 3601 people within 4 miles of the site rely upon groundwater supplies for drinking water. The nearest private well is located onsite north of the Chitney residence, approximately 400 feet upgradient of the suspected drum burial area. The well was sampled during the Site Inspection and no contamination was detected. The nearest offsite residence potentially using groundwater is located approximately 0.25 mile west of the site. One reported community supply well, which serves a mobile home park, exists within 2 miles of the site.



Results of investigations conducted by NC Superfund Section and by Aquaterra, Inc. do not indicate the release of contaminants from the site to local surface water bodies, surface soils or the atmosphere. The potential remains for future release to the 15-mile surface water pathway via groundwater seepage, however, chemical analysis of surface water and sediment samples, and of groundwater samples from downgradient of the area of contamination indicate that present contamination of the surface water pathway is limited to acetone from an offsite source.

Based on the lack of current contamination of drinking water wells, fisheries, or sensitive environments attributable to the site, no further remedial action under CERCLA is recommended at the site. It is recommended, however, that the State follow up the investigation of groundwater and surface water sediment contamination.

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